

We claim:

1. A process for the production of unsaturated nitrogen containing compounds comprising:

5 reacting a compound containing an -NH- or -NH₂- functional group next to a carbon sp² center with a compound of the formula



where X is either chloride, bromide or iodide;

R₁ is either hydrogen, an alkyl group or an aryl group;

10 R₂ is independently selected from hydrogen, methyl or trimethylsilyl; and

R₃ is an optionally substituted aryl group;

in the presence of a stoichiometric amount of a base and a catalytic amount of a catalyst composition comprising a zero-valent nickel and an organophosphine ligand.

15 2. The process of Claim 1 wherein the unsaturated nitrogen containing compound is selected from the group consisting of enamides, enamines, aryl amines and aryl amides.

20 3. The process of Claim 1 wherein the compound containing -NH- or -NH₂- functional groups is selected from the group consisting of primary and secondary amides, anilines, imidazoles, carbamates, amidines, guanidines, amino thiazolines and ureas.

4. The process of Claim 1 wherein the base is selected from the group consisting of 1,8-diazabicyclo[5.4.0]undec-7-ene, 1,5-diazabicyclo[4.3.0]non-5-ene, and potassium tert-butoxide.

25 ~~5. The process of Claim 1 wherein the catalyst precursor composition is a complex of Ni(1,5-cyclooctadiene)₂ and tricyclohexylphosphine.~~

6. The process of Claim 1 wherein X is bromide, R₁ is a phenyl group and both of R₂ are hydrogen.

30 7. The process of Claim 1 wherein X is iodide and R₃ is a phenyl group substituted with CF₃.

8. A process for the production of unsaturated nitrogen containing compounds comprising:

35 reacting the salt of a compound containing an -NH- or -NH₂- functional group next to a carbon sp² center with a compound of the formula



where X is either chloride, bromide or iodide;

R₁ is either hydrogen, an alkyl group or an aryl group;

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R_2 is independently selected from hydrogen, methyl or trimethylsilyl; and

R_3 is an optionally substituted aryl group;

in the presence of a catalytic amount of a catalyst composition comprising a zero-valent nickel and an organophosphine ligand.

9. The process of Claim 8 wherein the unsaturated nitrogen containing compound is selected from the group consisting of enamides, enamines, aryl amines and aryl amides.

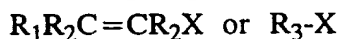
10. The process of Claim 8 wherein the catalyst precursor composition is a complex of $Ni(1,5\text{-cyclooctadiene})_2$ and tricyclohexylphosphine.

11. The process of Claim 8 wherein X is bromide, R_1 is a phenyl group and both of R_2 are hydrogen.

12. The process of Claim 8 wherein X is iodide and R_3 is a phenyl group substituted with CF_3 .

13. A process for the production of unsaturated nitrogen containing compounds comprising:

reacting mono or dialkylamine with a compound of the formula



where X is either chloride, bromide or iodide;

R_1 is either hydrogen, an alkyl group or an aryl group;

R_2 is independently selected from hydrogen, methyl or trimethylsilyl; and

R_3 is an optionally substituted aryl group;

in the presence of a stoichiometric amount of a base and a catalytic amount of a catalyst composition comprising a zero-valent nickel and an organophosphine ligand.

14. The process of Claim 13 wherein the unsaturated nitrogen containing compound is selected from the group consisting of enamides, enamines, aryl amines and aryl amides.

15. The process of Claim 13 wherein the base is selected from the group consisting of 1,8-diazabicyclo[5.4.0]undec-7-ene, 1,5-diazabicyclo[4.3.0]non-5-ene, and potassium tert-butoxide.

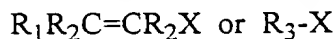
16. The process of Claim 13 wherein the catalyst precursor composition is a complex of $Ni(1,5\text{-cyclooctadiene})_2$ and tricyclohexylphosphine.

17. The process of Claim 13 wherein X is bromide, R_1 is a phenyl group, and both of R_2 are hydrogen.

18. The process of Claim 13 wherein X is iodide and R₃ is a phenyl group substituted with CF₃.

19. A process for the production of unsaturated nitrogen containing compounds comprising:

reacting a compound containing an -NH- or -NH₂- functional group next to a carbon sp² center with a compound of the formula



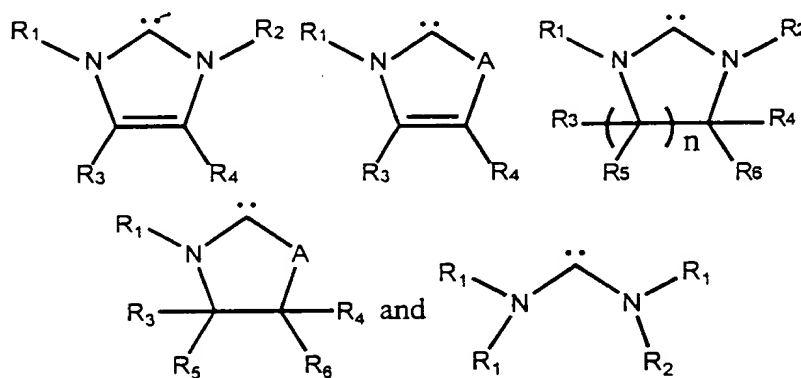
where X is either chloride, bromide, or iodide;

R₁ is either hydrogen, an alkyl group or an aryl group;

R₂ is independently selected from hydrogen, methyl or trimethylsilyl; and

R₃ is an optionally substituted aryl group;

in the presence of a stoichiometric amount of a base and a catalyst composition comprising comprising a zero-valent nickel and a carbene ligand selected from the group consisting of



wherein:

R¹ and R² are each independently hydrocarbyl or substituted hydrocarbyl;

R³, R⁴, R⁵ and R⁶ are independently an element more electronegative than carbon, a substituted element more electronegative than carbon, hydrogen, hydrocarbyl, substituted hydrocarbyl or an inert functional group;

n is an integer from 1 to 4; and

A is S or O;

whereby an unsaturated nitrogen containing compound is produced.

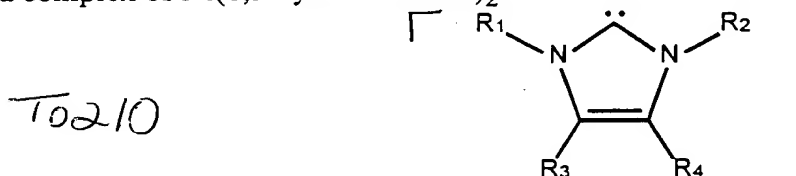
20. The process of Claim 19 wherein the unsaturated nitrogen containing compound is selected from the group consisting of enamides, enamines, aryl amines and aryl amides.

21. The process of Claim 19 wherein the compound containing -NH- or -NH₂- functional groups is selected from the group consisting of primary and

secondary amides, anilines, imidazoles, carbamates, amidines, guanidines, amino thiazolines and ureas.

22. The process of Claim 19 wherein the base is selected from the group consisting of 1,8-diazabicyclo[5.4.0]undec-7-ene and 1,5-diazabicyclo[4.3.0]non-5-ene.

23. The process of Claim 19 wherein the catalyst precursor composition is a complex of $\text{Ni}(\text{1,5-cyclooctadiene})_2$ and a carbene of the formula



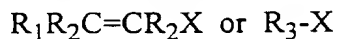
where R^1 and R^2 are independently selected from the group consisting of mesityl and adamantyl; and

R^3 and R^4 are selected from the group consisting of methyl and hydrogen.

24. The process of Claim 19 wherein X is chloride and R_3 is a phenyl group.

25. A process for the production of unsaturated nitrogen containing compounds comprising:

reacting the salt of a compound containing an -NH- or -NH₂- functional group next to a carbon sp² center with a compound of the formula



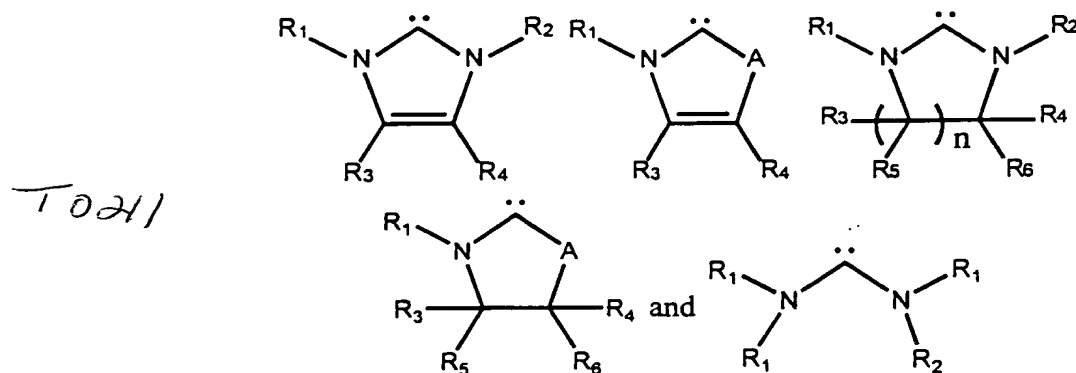
where X is either chloride, bromide, or iodide;

R_1 is either hydrogen, an alkyl group or an aryl group;

R_2 is independently selected from hydrogen, methyl or trimethylsilyl; and

R_3 is an optionally substituted aryl group;

in the presence of a stoichiometric amount of a base and a catalyst composition comprising comprising a zero-valent nickel and a carbene ligand selected from the group consisting of



wherein:

R^1 and R^2 are each independently hydrocarbyl or substituted hydrocarbyl;

R^3 , R^4 , R^5 and R^6 are independently an element more electronegative than carbon, a substituted element more electronegative than carbon, hydrogen, hydrocarbyl, substituted hydrocarbyl or an inert functional group;

n is an integer from 1 to 4; and

A is S or O;

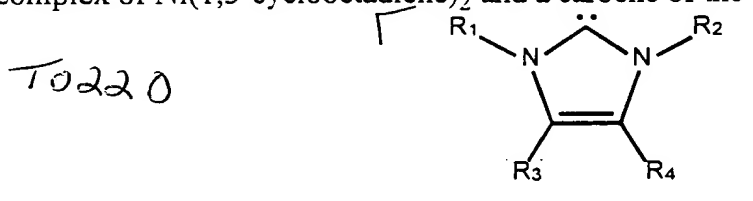
whereby an unsaturated nitrogen containing compound is produced.

26. The process of Claim ~~25~~ wherein the unsaturated nitrogen containing compound is selected from the group consisting of enamides, enamines, aryl amines and aryl amides.

27. The process of Claim ~~25~~ wherein the compound containing -NH- or -NH₂- functional groups is selected from the group consisting of primary and secondary amides, anilines, imidazoles, carbamates, amidines, guanidines, amino thiazolines and ureas.

28. The process of Claim ~~26~~ wherein the base is selected from the group consisting of 1,8-diazabicyclo[5.4.0]undec-7-ene and 1,5-diazabicyclo[4.3.0]non-5-ene.

29. The process of Claim ~~28~~ wherein the catalyst precursor composition is a complex of Ni(1,5-cyclooctadiene)₂ and a carbene of the formula



where R^1 and R^2 are independently selected from the group consisting of mesityl and adamantyl; and

R^3 and R^4 are selected from the group consisting of methyl and hydrogen.

30. The process of Claim ~~25~~ wherein X is chloride and R_3 is a phenyl group.

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